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PS Form 3800, August 2006 See Reverse for Instructions

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bp

BP Products North America Inc.
2815 Indianapolis Blvd.
P.O. Box 710
Whiting, IN 46394-0710
USA

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

December 13, 2011

Indiana Department of Environmental Management
OWQ Data Management Section
100 North Senate Avenue
Indianapolis, IN 46206

Subject: NPDES Permit No. 0000108, Semi Annual WET Testing Results

Please find enclosed two copies of the Whole Effluent Toxicity Report for BP Products North America Inc. – Whiting Business Unit for the month of October 2011. Results are reported according to EPA 821-R-02-013 Section 10 (Report Preparation) for NPDES permit IN0000108 Outfall 005 Effluent. Chronic Toxicity TUc was 2.0 and Acute Toxicity TUa was <1.0.

BP plans to conduct WET testing in April and October of each calendar year. The next sampling event will be in April 2012.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or need any additional information, please contact Tim Chen at (219) 473-1286.

Sincerely,

Nick Spencer
Business Unit Leader

Attachments

CC: Nick Ream (IDEM – Merrillville, IN)

Whole Effluent Toxicity Test Results

Prepared for:

BP Products North America
Whiting, Indiana

Prepared by:
ENVIRON International Corporation
Nashville, Tennessee

Date:
October 2011

Project Number:
20-19696D

ENVIRON

November 1, 2011

Mr. Rick Solan
BP Products North America
2831 Indianapolis Blvd., Stop 10-2
Whiting, IN 46394

Re: Whole Effluent Toxicity Test Results – October 2011
ENVIRON Project No. 20-19696D

Dear Mr. Solan:

Attached are the results of the *Pimephales promelas* (fathead minnow) chronic (7-day) Whole Effluent Toxicity (WET) test performed with composite samples of Outfall 005 effluent. This cover letter contains a test overview and summary of test results. The detailed report formatted to meet guidelines specified in your NPDES discharge permit (i.e., following the outline in Section 10 of EPA 821-R-02-013) is attached.

Three, 24-hour composite samples were evaluated in the WET test. Testing was conducted in accordance with Permit No. IN0000108. Samples were collected on October 10, 12, and 14, 2011 and used at the ENVIRON Toxicology Laboratory within 36 hours of collection at temperatures meeting the USEPA-required receipt temperature range of 0 to 6.0 °C (see chain-of-custody forms). Test organisms were exposed to effluent concentrations of 6.25, 12.5, 25, 50, and 100 percent effluent and a moderately hard water control. Chronic toxicity test methods followed EPA 821-R-02-013, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition Section 11*. Fish were fed twice daily with 0.15 g *artemia* (brine shrimp nauplii) that was rinsed with freshwater to remove salinity before use. Test results are presented below:

Chronic Test Results – Outfall 005 Effluent	
96-hr LC50	> 100%
TUa (100/LC50)	< 1.0
NOEC Survival (7 day)	50%
NOEC Growth (7 day)	50%
IC25 (7 day)	68%
TUc ($100/NOEC_{growth}$)	2.0

No acute (96 hour) toxicity was observed (LC50 greater than 100 percent effluent). Chronic (seven day) toxicity was observed in the 100 percent effluent exposures as indicated by survival and growth NOEC (No Observed Effects Concentration) values of 50 percent effluent. This corresponds to an NOEC-based TUc value of 2.0. The chronic 25 percent Inhibition Concentration (IC25) value was 68 percent effluent.

201 Summit View Drive, Suite 300, Brentwood, TN 37027
Tel: +1 615.377.4775 Fax: +1 615.377.4976
www.environcorp.com

Test controls met USEPA criteria for test acceptability. The concentration-response relationship for growth is described as Number 3 in EPA821-B-00-004 *Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing.* The dose-response indicates stimulation at lower concentrations, and significant effect at highest concentrations. Test precision as measured by the Percent Minimum Significant Difference (PMSD) value for this test was 24.1 percent, which is within the USEPA PMSD bounds of 12 to 30 percent for fathead minnow growth. This test is valid for determination of permit compliance. The monthly reference toxicant test for fathead minnow met all test acceptability criteria and was in acceptable range for determining normal test performance.

In accordance with NELAP requirements for listing the number of report pages, this report contains 32 pages, which include the cover letter, detailed report (Attachment 1), associated chemical data (Attachment 2), statistical analyses and raw data (Attachment 3), chain-of-custody forms (Attachment 4), reference toxicant data (Attachment 5), and associated separator pages.

Thank you for the continued opportunity to be of service to BP Products North America. If you have any questions concerning these data, please call Teri Horsley at (615) 377-4775, ext 168.

Sincerely,

ENVIRON International Corporation

Teri L. Horsley
Project Manager, Ecotoxicology

Robin L. Garibay, REM
Principal

cc: Rose Hererra

Attachment 1:
Detailed Report

BP Whiting Detailed Toxicity Test Report – October 2011 Fathead Minnow Chronic Test

1 Introduction

The BP Whiting Refinery is located in Whiting, Indiana at 2815 Indianapolis Boulevard and discharges treated effluent to Lake Michigan under a National Pollutant Discharge Elimination System (NPDES) permit (Permit No. IN0000108) as administered by the Indiana Department of Environmental Management (IDEM). The subject discharge permit requires semi-annual (twice per year) Whole Effluent Toxicity (WET) testing with the fathead minnow. In support of these discharge monitoring requirements, the WET tests described herein were conducted. Testing was performed by:

ENVIRON International Corporation (ENVIRON)
201 Summit View Drive
Lower/Lab Level
Brentwood, TN 37027
(615 377-4775)

The objective of this test was to provide WET test data in support of BP Whiting's NPDES discharge monitoring requirements for Outfall 005.

2 Plant Operations

The BP Whiting Refinery produces various grades of gasoline, diesel and heating fuel, asphalt, and coke, among other products from refined crude oil. The facility operates 24 hours a day, seven days per week under normal operations. Some facility processes are occasionally suspended for maintenance or as a result of unplanned events (e.g., equipment failure, etc.). Wastewater treatment consists of bar screening, grit removal, oil/water separator, storm surge tank, equalization tank, flocculation/flotation, activated sludge, settling and multimedia filtration prior to discharge to Lake Michigan. Wastewater retention time is approximately 17 to 18 hours for this approximately average of 20 MGD discharge through Outfall 005. The design flow of the treatment plant at the time of WET test sampling was 35 MGD.

3 Effluent and Dilution Water

3.1 Effluent Samples

Composite Outfall 005 effluent samples were collected from the lake front sample shed at the NPDES permit-specified sample location for WET and chemical sampling of this outfall. Composite samples were obtained from a continuous flow of effluent pulled from the effluent discharge to provide representative effluent samples. The latitude and longitude of this sampling point is 41° 40' 36" N and 87° 28' 16" W. Three effluent samples were collected on the following dates (date indicates the day on which the composite sample was completed): October 10, 12, and 14, 2011. The composite sampler initiated sampling at 0751 for the first sample and 0700 for the second and third samples and sampled hourly for 24 hours on the dates indicated, providing the permit-specified 24 individual sample aliquots (within a 24 hour period) composited for toxicity testing. An Isco automatic sampler was used to collect the hourly samples that were composited into a common sample container (maintained on ice during collection). WET testing was supported by chemical analyses

(Attachment 2). The physical and chemical data associated with each sample used in WET testing are provided on the laboratory bench sheets documenting these and other sample conditions (Attachment 3). The mean daily discharges on sample collection dates were 12.6 mgd, 14.5 mgd, and 14.1 mgd, on October 10, 12, and 14, 2011, respectively. The lapsed time between sample collection and receipt at the ENVIRON WET testing laboratory was 23 hours and 54 minutes, 24 hours and 26 minutes, and 25 hours and 42 minutes, for samples received on October 11, 13, and 15, respectively. The respective sample receipt temperatures were 0.4 °C, 0.1 °C, and 0.6 °C.

3.2 Dilution Water

The dilution and control water for this test was USEPA moderately hard water, prepared in accordance with EPA 821-R-02-013. The water was prepared by ENVIRON using de-ionized water to which the four reagent-grade salts specified by USEPA were added and aerated for a minimum of 24 hours before use. No pre-treatment of the water occurred following this preparation. As detailed in Attachment 3, dilution water hardness and alkalinity ranged from 84 to 86 mg/L $CaCO_3$ and from 50 to 52 mg/L $CaCO_3$, respectively. Control water pH ranged from approximately 7.2 to 7.9 s.u., and dissolved oxygen was always greater than 8 mg/L during the test.

4 Test Method

The fathead minnow chronic WET test method detailed in Section 1000.0 of EPA 821-R-02-013 (*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms – Fourth Edition*) was followed. Per the method, seven-day fathead minnow survival and growth (dry weight), were the test endpoints assessed. There were no deviations from this test method. The test was initiated at 1030 on October 11th and terminated at 1230 on October 18th. Disposable plastic 400 mL test vessels containing 350 mL test solutions were used. Four replicate exposures of 10 organisms were used for each of the five effluent exposures and the control exposures. Test organisms had been acclimated to the control water at 24 °C prior to test initiation. Test temperatures ranged from 24.0 to 25.1 °C. Neither aeration nor pH adjustment were required during the test. Test organisms were fed a minimum of 0.15 g of live Artemia (brine shrimp) nauplii twice daily. Brine shrimp were rinsed with freshwater to remove salinity prior to use in tests. Test solutions were renewed daily.

5 Test Organisms

Fathead minnows (Pimephales promelas) less than 24 hours old at test initiation were used in this testing. Organisms were obtained from a commercial laboratory (Environmental Consulting and Testing) with whom ENVIRON has a long-standing record of successful use in WET tests. Organisms were obtained from laboratory-reared stock traceable to USEPA cultures. Taxonomic verification is provided by the laboratory. No treatments for disease were used on the fish used in these WET tests.

6 Quality Assurance

Reagent grade sodium chloride (NaCl, Reagents, Inc.) is used in monthly reference toxicant tests conducted to document test organism sensitivity and test endpoint precision. Organisms tested are from the same commercial source used in WET tests, and organism handling and testing in reference toxicant tests is identical to that of WET tests. At the time

of this test, the most recently completed reference toxicant test was initiated on October 4, 2011. This test was found to be within method-specified control bounds as indicated in Attachment 5 where the control chart is provided. USEPA moderately hard water was the dilution and control water in all reference toxicant tests. The 25 percent inhibition concentration is used to track reference toxicant test performance and as such the percent minimum significant difference statistic is not applicable. As documented in ENVIRON's Standard Operating Procedures (SOP) manual, pH, dissolved oxygen, and conductivity meters calibrated daily according to manufacturer's instructions were used to document these water quality conditions during reference toxicant tests. Standard, titration-based methods were used to document control water hardness and alkalinity as specified in the ENVIRON SOP manual.

7 Results

Raw WET test data are provided in Attachment 3, serving as documentation of the daily effects observed in each test and control replicate. Final test results are also provided in graphical form in Attachment 3 for the specified biomass basis (i.e., integration of survival and growth endpoints). Commercial software (ToxCalc Version 5.0), which is designed specifically to meet USEPA-specified statistical requirements outlined in Section 9.0 of EPA 821-R-02-013 was used for analysis of the fathead minnow survival and growth data. All of the physical and chemical data associated with the toxicity tests are listed in the test bench sheets provided in Attachment 3. In summary, these are:

Parameter (units)	**Range observed in Test (all exposures)**
pH (s.u.)	6.94 to 7.84
Dissolved Oxygen (mg/L)	7.4 to 8.8
Conductivity (*u*mno/cm)	377 to 3,230
Temperature (°C)	24.0 to 25.1
Alkalinity (mg/L $CaCO_3$)	75 to 160 (100% effluent)
Hardness (mg/L $CaCO_3$)	212 to 232 (100% effluent)

The acute (96 hour) median lethal concentration (LC50) value for this test is greater than 100 percent effluent based on the absence of 50 percent or more morality in all test exposures (five percent mortality was observed in the 100 percent effluent exposure). This corresponds to an acute toxicity unit (TUa) value of less than 1. The biomass method-based chronic tests endpoints of a 25 percent inhibition concentration (IC25) and No Observed Effects Concentration (NOEC) value based on survival and growth were assessed. The respective IC25 and NOEC values for this test were 68 percent and 50 percent effluent. The resulting NOEC-based chronic toxic unit value (TUc) is 2.0. The Percent Minimum Significant Difference (PMSD) value (applicable to the NOEC value only) for this test was 24.1 percent.

Attachment 4 contains chain-of-custody documentation.

8 Conclusions and Recommendations

There are no WET permit limits in the current NPDES discharge permit. Only twice per year monitoring is required. No acute toxicity was indicated during this test; however, chronic toxicity to full-strength effluent was indicated.

Attachment 2:
Chemical Data

Oct-2011

LIMS ID			Sunday 10/9/2011 1840792/1841137				Tuesday 10/11/2011 1841642/1842111				Thursday 10/13/2011 1842648/1843092			
Parameter	Units of Measure	Analysis Method	Result	Sample Comp/Grab	Sample Date	Sample Tech	Result	Sample Comp/Grab	Sample Date	Sample Tech	Result	Sample Comp/Grab	Sample Date	Sample Tech
BOD5	mg/L	SM 5210 B	1.6	Comp	10/9/2011	NP	2.6	Comp	10/11/2011	JPO	8.3	Comp	10/13/2011	JPO
TSS	mg/L	SM 2540 D	9.2	Comp	10/9/2011	NP	13.2	Comp	10/11/2011	NP	11.6	Comp	10/13/2011	NP
COD	mg/L	SM 5220 D	51	Comp	10/9/2011	NP	34	Comp	10/11/2011	NP	60	Comp	10/13/2011	NP
Oil & Grease	mg/L	EPA 1664A	<0.3	Grab	10/10/2011	NP	0.5	Grab	10/12/2011	NP	1.0	Grab	10/14/2011	JPO
Ammonia	mg/L	SM 4500 NH3 F	<0.10	Comp	10/9/2011	JPO	<0.10	Comp	10/11/2011	JPO	0.33	Comp	10/13/2011	JPO
Total Chromium	mg/L	SM 3111 B	<0.01	Comp	10/9/2011	JPO	<0.01	Comp	10/11/2011	JPO	<0.01	Comp	10/13/2011	JPO
Hexavalent Cr	mg/L	SM 3500 Cr D	<0.005	Grab	10/10/2011	NP	<0.005	Grab	10/12/2011	NP	<0.005	Grab	10/14/2011	NP
Phenolics	mg/L	SM 5530 D / EPA 420.1	<0.01	Comp	10/9/2011	JPO	<0.01	Comp	10/11/2011	JPO	<0.01	Comp	10/13/2011	JPO
Phospsorous (PO4)	mg/L	SM 4500 P	0.29	Comp	10/9/2011	NP	0.10	Comp	10/11/2011	NP	0.02	Comp	10/13/2011	NP
Sulfides	mg S2-/L	SM 4500 S2- D	0.03	Comp	10/9/2011	JPO	0.02	Comp	10/11/2011	JPO	0.02	Comp	10/13/2011	NP
pH	S.U.	SM 4500 H+ B	7.2	Grab	10/10/2011	PG	7.10	Grab	10/12/2011	GC	6.8	Grab	10/14/2011	TT
Microbac Tests														
Total Mercury	ng/L	1631 E	2.83	Grab	10/10/2011	Microbac	5.88	Grab	10/12/2011	Microbac	11.0	Grab	10/14/2011	Microbac
Total Vanadium	mg/L	200.8_R5.4	0.033	Comp	10/9/2011	Microbac	0.018	Comp	10/11/2011	Microbac	0.28	Comp	10/13/2011	Microbac

Attachment 3:
Statistical Anaylses and Raw Data

Larval Fish Growth and Survival Test-7 Day Growth

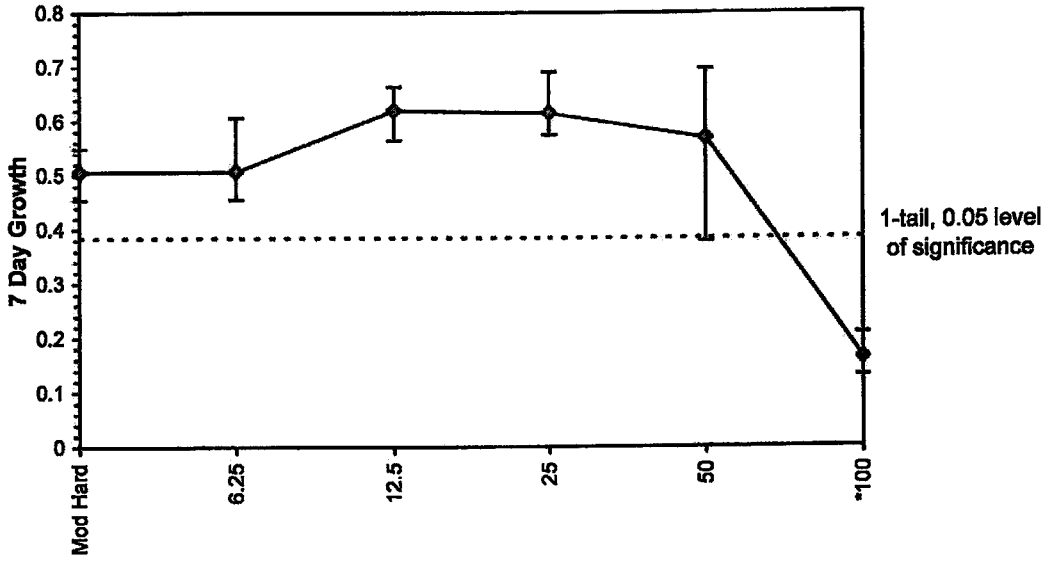
Start Date:	10/11/2011	Test ID:	13888	Sample ID:	BP_091005 TW 12/7/11
End Date:	10/18/2011	Lab ID:	ENVIRON	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
Mod Hard	0.5150	0.4550	0.5060	0.5490
6.25	0.4560	0.4960	0.4710	0.6070
12.5	0.6040	0.6480	0.5640	0.6630
25	0.5970	0.6900	0.5740	0.5970
50	0.6960	0.6320	0.5640	0.3780
100	0.1450	0.1300	0.1650	0.2080

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Mod Hard	0.5062	1.0000	0.5062	0.4550	0.5490	7.676	4			
6.25	0.5075	1.0025	0.5075	0.4560	0.6070	13.469	4	-0.025	2.410	0.1222
12.5	0.6197	1.2242	0.6197	0.5640	0.6630	7.231	4	-2.238	2.410	0.1222
25	0.6145	1.2138	0.6145	0.5740	0.6900	8.379	4	-2.135	2.410	0.1222
50	0.5675	1.1210	0.5675	0.3780	0.6960	24.203	4	-1.208	2.410	0.1222
*100	0.1620	0.3200	0.1620	0.1300	0.2080	20.897	4	6.789	2.410	0.1222

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)					0.93043		0.916		-0.6193	2.67151
Bartlett's Test indicates equal variances (p = 0.14)					8.29943		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	0.1222	0.24138	0.11701	0.00514	3.4E-07	5, 18
Treatments vs Mod Hard										

Dose-Response Plot



Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	10/11/2011	Test ID:	13888	Sample ID:	BP_001 005 TW1 12-1-11
End Date:	10/18/2011	Lab ID:	ENVIRON	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:					

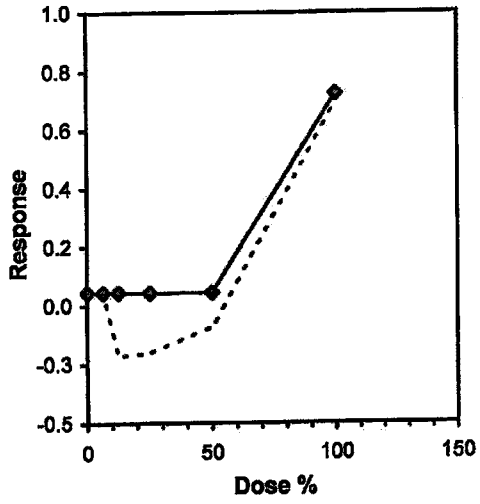
Conc-%	1	2	3	4
Mod Hard	0.5150	0.4550	0.5060	0.5490
6.25	0.4560	0.4960	0.4710	0.6070
12.5	0.6040	0.6480	0.5640	0.6630
25	0.5970	0.6900	0.5740	0.5970
50	0.6960	0.6320	0.5640	0.3780
100	0.1450	0.1300	0.1650	0.2080

			Transform: Untransformed					Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
Mod Hard	0.5062	1.0000	0.5062	0.4550	0.5490	7.676	4	0.5631	1.0000
6.25	0.5075	1.0025	0.5075	0.4560	0.6070	13.469	4	0.5631	1.0000
12.5	0.6197	1.2242	0.6197	0.5640	0.6630	7.231	4	0.5631	1.0000
25	0.6145	1.2138	0.6145	0.5740	0.6900	8.379	4	0.5631	1.0000
50	0.5675	1.1210	0.5675	0.3780	0.6960	24.203	4	0.5631	1.0000
100	0.1620	0.3200	0.1620	0.1300	0.2080	20.897	4	0.1620	0.2877

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.93043	0.916	-0.6193	2.67151
Bartlett's Test indicates equal variances (p = 0.14)	8.29943	15.0863		

Linear Interpolation (200 Resamples)

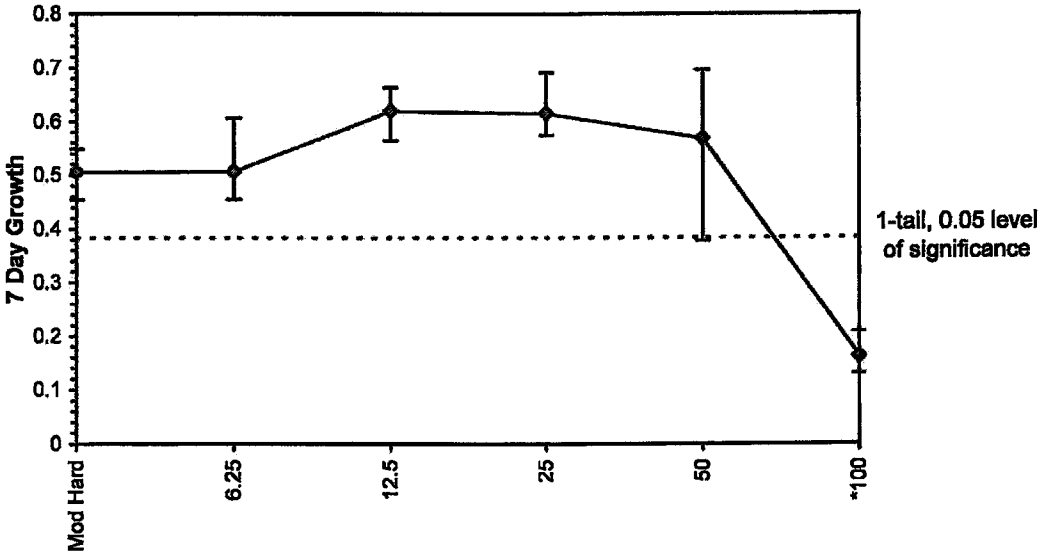
Point	%	SD	95% CL(Exp)		Skew
IC25	67.549	3.218	50.594	69.585	-2.2573



Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	10/11/2011	Test ID:	13888	Sample ID:	BP_001 005 TW1 10/7/11
End Date:	10/18/2011	Lab ID:	ENVIRON	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/11/2011	Test ID:	13888	Sample ID:	BP_001005 TWI 12/7/11
End Date:	10/18/2011	Lab ID:	ENVIRON	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:					

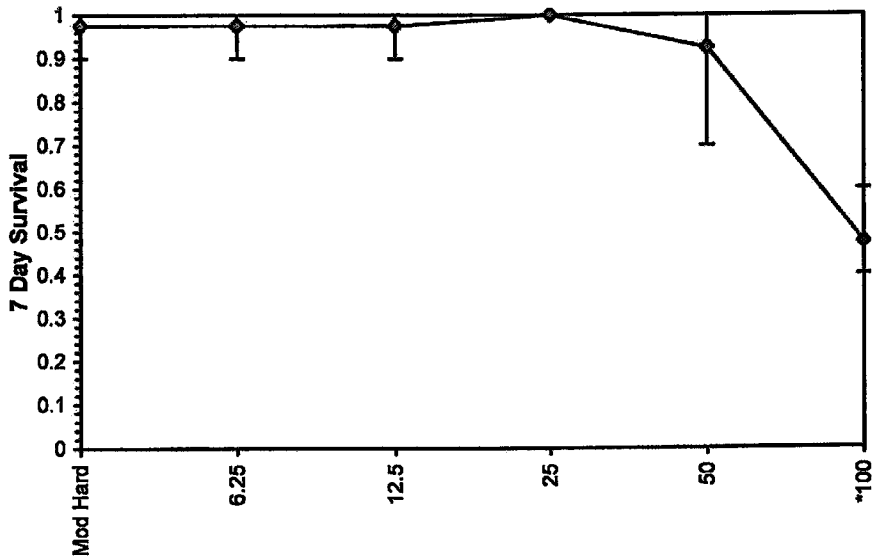
Conc-%	1	2	3	4
Mod Hard	1.0000	0.9000	1.0000	1.0000
6.25	0.9000	1.0000	1.0000	1.0000
12.5	1.0000	0.9000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	0.7000
100	0.5000	0.4000	0.4000	0.6000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
Mod Hard	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4		
6.25	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00
12.5	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00
25	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
50	0.9250	0.9487	1.3068	0.9912	1.4120	16.103	4	17.50	10.00
*100	0.4750	0.4872	0.7602	0.6847	0.8861	12.679	4	10.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.83563	0.916	-1.6008	3.51162
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2
Treatments vs Mod Hard				

Dose-Response Plot



ENVIRON FATHEAD MINNOW SURVIVAL AND GROWTH 7-DAY CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1000.0

TEST LOG NO.: 13888
JOB NUMBER.: 20-19696D
INDUSTRY: BP Whiting
EFFLUENT: OUTFALL 007 TLH 12/7/11
DILUTION WATER: Mod Hard
NPDES: Yes X No
FOOD BATCH: 5501

BEGINNING: HRS: 1030 DATE: 10/11/11
ENDING: HRS: 1230 DATE: 10/18/11
TEST DILUTIONS: 6.25 - 100
ORGANISM AGE (date): 10/10/11
ORGANISM SOURCE: ECT #3023
SOURCE TEMP @ TEST START: 24.0°C
RANDOMIZED BY: AW

PHOTOPERIOD: 16 hr light/8 hr dark
FEEDING REGIME:
0.15 mL Artemia @ 2 times/day
TEST VESSEL CAPACITY: 450 mL
TEST SOLUTION VOLUME: 250 - 300 mL
NO. ORGANISMS/TREATMENT: 10
NO. REPLICATES: 4

CONC (%)	REP ID	SURVIVAL (#) START	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
Mod Hard	A	10	10	10	10	10	10	10	10
	B	10	10	10	9	9	9	9	9
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.4	24.3/24.0	AW/AW	AW/AW	AW/AW	AW/AW	24.9/24.2	24.3
6.25%	A	10	10	9	9	9	9	9	9
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.3	24.1/24.0	AW/AW	AW/AW	AW/AW	AW/AW	24.3/24.0	24.5
12.5%	A	10	10	10	10	10	10	10	10
	B	10	10	10	9	9	9	9	9
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.4	24.0/24.0	AW/AW	AW/AW	AW/AW	AW/AW	24.1/24.1	24.1
25%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	E								
	Temp(°c):old/new	24.7	24.0/24.0	AW/AW	AW/24.5	AW/AW	AW/AW	24.0/24.1	24.9
50%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	9	9	7	7
	E								
	Temp(°c):old/new	24.5	24.1/24.0	AW/AW	AW/AW	AW/AW	AW/AW	24.1/24.0	25.1
100%	A	10	10	10	10	9	7	6	5
	B	10	10	10	9	9	7	5	4
	C	10	10	10	9	8	8	7	4
	D	10	10	9	7	7	7	7	6
	E								
	Temp(°c):old/new	24.7	24.0/24.0	AW/AW	AW/AW	AW/AW	AW/AW	24.1/24.2	24.8
Test Renewal	Time	1030	1433	1634	0935	1144	1154	0942	1230
	Date	10/11/11	10/12/11	10/13/11	10/14/11	10/15/11	10/16/11	10/17/11	10/18/11
	Initials	AW	AH	HM	HM	HM	HM	AH	AW
morning feeding	Int/Time		LM 0648	LM 0700	LM 0705	AW 0741	AW 0754	LM 0745	
afternoon feeding	Int/Time	AW 1616	HM 1537	HM 1548	HM 1549	AW 1538	AW 1535	AW 1620	

ENVIRON FATHEAD MINNOW SURVIVAL AND GROWTH 7-DAY CHRONIC TOXICITY TEST
EPA-821-R-02-013 Method 1000.0

TEST LOG NO.: 13888 BEGINNING: HRS: 1030 DATE: 10/11/11
JOB NO.: 20-19696D ENDING: HRS 1230 DATE: 10/18/11
INDUSTRY: BP Whiting
EFFLUENT: Outfall 005 NO. ORGANISMS/TREATMENT: 10
NPDES: Yes ___ No ___ NO. REPLICATES: 4
TM 10/7/11

PHOTOPERIOD: 16 hr light
FEEDING REGIME:
0.15 mL Artemia @ 2 times/day
TEST VESSEL CAPACITY: 450 mL
TEST SOLUTION VOLUME: 250 mL

		GROWTH RESULTS						
CONC (%)	REP ID	Boat ID 63	Tare wt (g)	Combined wt (g)	Tot Fish wt (g)	# of Fish	Fish Wt (mg) Per Final # of Fish	HM 10/19
Mod Hard	A	1	1.08769	1.09284	0.00515	10	0.515	0.515
	B	2	1.10044	1.10499	0.00455	9	0.505	AVG Control
	C	3	1.08690	1.09190	0.00500	10	0.500	Fish wt. 0.518 mg
	D	4	1.09169	1.09718	0.00549	10	0.549	(using final #)
	E							
6.25%	A	5	1.11385	1.11781	0.00396	9	0.0044	HM 10/19
	B	6	1.11038	1.12134	0.00496	10		
	C	7	1.09410	1.09931	0.00471	10	Oven ID: 2	
	D	8	1.08904	1.09511	0.00607	10		
	E							
12.5%	A	9	1.06837	1.07441	0.00604	10		
	B	10	1.08361	1.08859	0.00498	9	Temp 104 Tins In: 10/18/11 1318	
	C	11	1.06947	1.07511	0.00564	10	Date/Time	
	D	12	1.10080	1.10729	0.00649	10	Temp 102 Tins Out: 10/19/11 0831	
	E						Date/Time	
25%	A	13	1.09492	1.11539	0.00597	10		
	B	14	1.08909	1.09599	0.00690	10	FINAL WEIGHTS	
	C	15	1.07348	1.07828	0.00574	10		
	D	16	1.10098	1.10695	0.00597	10	DATE: 10/19/11	
	E						INITIALS: HM	
50%	A	17	1.08538	1.09274	0.00696	10		
	B	18	1.09185	1.09817	0.00632	10		
	C	19	1.08249	1.08813	0.00564	10		
	D	20	1.09900	1.09445	0.00378	7		
	E	HM 10/19	1.09107					
100%	A	21	1.10294	1.10439	0.00145	5		
	B	22	1.10413	1.10543	0.00130	4		
	C	23	1.08706	1.08871	0.00165	4		
	D	24	1.07446	1.07654	0.00208	6		
	E							
	A							
	B							
	C							
	D							
	E							
	Initials / Date:		HM 10/11	HM 10/19				

TEST LOG NO. 13888

JOB NO. 20-19696D

CLIENT/SAMPLE ID: BP Whiting 005

TEST ORGANISM: FM

DATE: 10/11/11

D.O. (mg/L)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	8.8	8.8	8.9	8.5	8.5	8.6	8.0	8.3	8.9	8.4	8.8	8.2	8.7	8.6
6.25%	8.8	7.6	8.7	8.6	8.6	8.5	8.0	8.0	8.6	8.3	8.7	8.3	8.8	8.3
12.5%	8.6	7.9	8.5	8.2	8.3	8.2	7.9	7.9	8.5	8.1	8.5	8.3	8.6	7.9
25%	8.5	7.9	8.5	8.8	8.3	8.2	8.0	7.9	8.4	7.9	8.4	8.2	8.6	7.7
50%	8.5	7.7	8.5	8.8	8.6	8.2	8.0	7.9	8.4	7.7	8.3	8.2	8.5	8.1
100%	8.6	7.4	8.4	8.7	8.6	8.3	8.1	8.0	8.6	7.6	8.3	8.2	8.3	7.7

pH (s.u.)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	7.78	7.94	7.83	7.34	7.80	7.18	7.81	7.72	7.78	7.40	7.85	7.23	7.85	7.63
6.25%	7.72	7.72	7.73	7.02	7.70	6.95	7.84	7.72	7.71	7.17	7.82	6.94	7.79	7.56
12.5%	7.72	7.66	7.71	6.85	7.72	6.98	7.80	7.69	7.70	7.08	7.72	6.82	7.77	7.80
25%	7.67	7.60	7.68	6.82	7.08	7.04	7.77	7.66	7.64	7.02	7.73	6.84	7.73	7.52
50%	7.61	7.57	7.67	6.86	7.05	7.09	7.74	7.67	7.60	7.02	7.67	6.86	7.69	7.49
100%	7.49	7.59	7.60	7.30	7.50	7.16	7.66	7.63	7.48	7.07	7.59	6.85	7.59	7.42

Conductivity (µmhos/cm)

Concentration	Start	Day 1 Old	Day 1 New	Day 2 Old	Day 2 New	Day 3 Old	Day 3 New	Day 4 Old	Day 4 New	Day 5 Old	Day 5 New	Day 6 Old	Day 6 New	Day 7
MH	217	230	218	228	200	268	228	236	224	250	248	224	205	227
6.25%	395	397	378	377	420	438	419	418	399	382	407	384	417	427
12.5%	555	560	542	546	559	567	610	569	573	536	575	554	582	565
25%	929	919	944	939	815	966	967	918	945	913	1057	942	1003	1064
50%	1653	1643	1588	1610	1419	1590	1694	1546	1651	1525	1757	1632	1629	1651
100%	2980	2880	2900		3020	2920	3050	2960	3210	2910	3230	3040	3050	3060
Params Intl/Time:	AW 0837	AW 665	AW 0835	AW 737	LH 0830	AW 0716	AW 0820	AW 0808	AW 0934	AW 0820	AW 0900	AW 713	AW 0732	AW 0707
Dilutions Intl/Time:	AW 0830		AW 0818		LH 0825		AW 0810		AW 0930		AW 0850		AW 0725	
Control Water Batch#:	4633		4633		4634		4634		4639		4639		4639	
Food Batch	3469.70		3501		3501		3501		3501		3501		3501	

3501 AW 10/11/11

L:\Ecotox Lab\LABFORMS\Client Test Sheets\BP Whiting\Param and Batch Sheet

TEST LOG NO. 13888 CLIENT: BP Whiting DATE OF TEST: 10/4/11

JOB NO. 20-19696D TEST TYPE(S) PERFORMED: Fm Chronic

100% EFFLUENT

Batch #	Sample ID	Sample Date	1st Use Date	Hardness mg/L CaCO3	Alkalinity mg/L	TRC mg/L	NH_3N mg/L
14195	Outfall 005	10/9-10/11	10/11/11	228	160	0.09	<0.1
14207	Outfall 005	10/11-12/11	10/13/11	232	120	0.03	<0.1
14220	Outfall 005	10/13-14/11	10/15/11	210	75	0.08	0.122

TLH 12/7/11

CONTROL / DILUTION WATER

Batch #	Sample ID	Sample Date	1st Use Date	Hardness mg/L CaCO3	Alkalinity mg/L	TRC mg/L
4633	MH	10/5/11	10/9/11	84	51	<0.02
4634	MH	10/5/11	10/12/11	86.4	52	<0.02
4634	MH	10/9/11	10/14/11	85.0	50	<0.02

Attachment 4:
Chain-of-Custody Forms

ENVIRON Test Log No. 13888

Project Name: 001 BP WET Testing Project Number: 20-19696D

Industry:

Phone: 219-473-3726 FAX:

County: Lake City: Whiting State: Indiana

Sample Collected by (print): Terry Claus

Sample Collected by (signature): Terry Claus

NPDES Permit No.:

NPDES Test: ☐ No ☐ Yes

CHAIN-OF-CUSTODY

ENVIRON

201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: (615) 377-4775
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Analysis Requested: Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other Toxicity Testing	Description Definitive or Screen	Sample B# (lab only)
OUTFall 001	Comp	10L	Y	10-9-11 0731	10-10-11 0731	1	7.0									X		14195
005 TLH	12/7/11																	

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks:

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ■ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition: (lab use only)
Terry Claus	10-10-11	12:00	FedEx		on ice
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Receipt Temp: 0.4	Containers/Volume Received: 10L
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 10/11/11	Time: 0745 / pH upon arrival: 7.79 / DO upon arrival: 9.7

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Sample Receipt Checklist:

Client: BP Whiting Sample ID(s) Outfall 007 005 TLH 12/7/11

Batch #'s 1467

1. Date/Time received 10/13/11 0726 by AJB
2. Cooler sealed and intact upon arrival? Yes No
3. Custody seals present? Yes No
4. Samples received below 6 degrees Celsius? Yes No
5. Was ice present? Yes No
6. Is the COC filled out correctly including the sample date/time and signed? Yes No
7. Was the sample received within 36 hours of collection? Yes
   No
8. Did the sample(s) arrive in good condition? Yes
   No
9. Was pH and DO measured and in range? Yes
   No
10. Was residual chlorine present? Yes
    No 0.03

Comments:

ple

STODY SEAL

Signature

10-13-11

Date

CU

CompuChem

a Division of
Liberty Analytical Corp.

ENVIRON Test Log No. 13888

Project Name: 001 Bf WET Testing Project Number: 20-19696D

Industry:

Phone: 219-473-3726 FAX:

County: Lake City: Whiting State: Indiana

Sample Collected by (print): Terry Claus

Sample Collected by (signature):

NPDES Permit No.:

NPDES Test: ☐ No ☐ Yes

CHAIN-OF-CUSTODY

ENVIRON

201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: (615) 377-4775
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Analysis Requested: Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other Toxicity Testing	Description Definitive or Screen	Sample B# (lab only)
Outfall 001	Comp	10L	Y	10-11-11 0700	10-12-11 0700	1	8.0									X		14207
005																		
7Q1 12/9/11																		

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **AW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks:

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ■ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition: (lab use only)
Terry Claus	10-12-11	1300			Onice
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Receipt Temp: 01	Containers/Volume Received: (1) 1gl
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 10/12/11	Time: 0726 pH upon arrival: 7.42 DO upon arrival: 9.2

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Sample Receipt Checklist:

Client: RD Whiting Sample ID(s) Outfall 005 TM 12/7/11

Batch #'s 14195

1. Date/Time received 10/11/11 0745 by AL
2. Cooler sealed and intact upon arrival? (Yes) No
3. Custody seals present? (Yes) No
4. Samples received below 6 degrees Celsius? (Yes) No
5. Was ice present? (Yes) No
6. Is the COC filled out correctly including the sample date/time and signed? (Yes) No
7. Was the sample received within 36 hours of collection? (Yes)
   No
8. Did the sample(s) arrive in good condition? (Yes)
   No
9. Was pH and DO measured and in range? (Yes)
   No
10. Was residual chlorine present? (Yes)
    No

Comments:

TRC 0.09

BP Whiting
10/15/11

ENVIRON Test Log No. 13888

Project Name: 001 BP WET Testing | Project Number: 20-19696D

Industry:

Phone: 219-473-3726 | FAX:

County: Lake | City: Whiting | State: Indiana

Sample Collected by (print): Terry Claus

Sample Collected by (signature): Terry Claus

NPDES Permit No.:

NPDES Test: ☐ No ☐ Yes

CHAIN-OF-CUSTODY

ENVIRON

201 Summit View Drive, Suite 300
Brentwood, TN 37027
PHONE: (615) 377-4775
FAX: (615) 377-4976

Sample Location / ID	Comp/Grab	Container Type	Chilled During Collection (Y/N)	Start Date/Time	End Date/Time	No. of Cntrs	Total Volume in liters	Analysis Requested: Acute Fathead minnow	Acute Bannerfin shiner	Acute *Ceriodaphnia dubia*	Acute *Daphnia pulex*	Chronic Fathead minnow	Chronic *Ceriodaphnia dubia*	Continuous Batch Tests	Discrete Batch Tests	Other Toxicity Testing	Description Definitive or Screen	Sample B# (lab only)
OUTFALL 005 TUH 12/7/11	Comp	10 L	Y	10-13-11 0700	10-14-11 0700	1	9.0									X		14220

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - Wastewater **SW** - Ambient Water **ML** - Mixed Liquor **SL** - Sludge **SD** - Sediment **OT** - Other _____

Remarks:

Measured TRC (if applicable): _____ mg/L

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples shipped via: ☐ FedEx ☐ Other Courier ☐ UPS ☐ Hand Delivered	Condition: (lab use only)
Terry Claus	10-14-11	12:00			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Receipt Temp: 0.6 °C	Containers/Volume Received: 1 10 L
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) Anita Bryant-Winton	Date: 10/15/11	Time: 0842 / pH upon arrival: 7.89 / DO upon arrival: 8.0

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Sample Receipt Checklist:

Client: BP Whiting Sample ID(s) Outfall 005 ~~001~~ TM 10/7/11

Batch #'s 14220

1. Date/Time received 10/15/11 0842 by AW
2. Cooler sealed and intact upon arrival? Yes No
3. Custody seals present? Yes No
4. Samples received below 6 degrees Celsius? Yes No
5. Was ice present? Yes No
6. Is the COC filled out correctly including the sample date/time and signed? Yes No
7. Was the sample received within 36 hours of collection? Yes No
8. Did the sample(s) arrive in good condition? Yes No
9. Was pH and DO measured and in range? Yes No
10. Was residual chlorine present? Yes No

TRC 0.08

Comments:

Attachment 5:
Reference Toxicant Data

Fathead Minnow CHRONIC REFERENCE TOXICANT TESTING-SODIUM CHLORIDE (NaCl) 2010 - 2011

Test Number	Log Number	Test Initiation Date	Control Survival (%) (*)	Control Mean Dry Weight (mg/fish) (*)	SURVIVAL NOEC (mg/L)	SURVIVAL LOEC (mg/L)	GROWTH NOEC (mg/L)	GROWTH LOEC (mg/L)	PMSD (%)	IC25 VALUE (mg/L)	IC25 CUMULATIVE MEAN (mg/L)	IC25 ST. DEV. (mg/L)	IC25 2+ STD. DEV.	IC25 2- STD. DEV.	Coefficient of Variation (%)
1	11662	04-May-10	97.5	0.246	6,000	>6,000	1,500	3,000	28.9	2,392	2,392				
2	12765	22-Jun-10	100	0.452	1,500	3,000	750	1,500	12.1	1,904	2,148	345	2,838	1,458	11
3	12787	08-Jul-10	100	0.523	1,500	3,000	1,500	3,000	16.4	3,132	2,476	618	3,713	1,239	20
4	12824	03-Aug-10	95	0.509	6,000	>6,000	375	750	16.7	934	2,091	922	3,934	247	38
5	12870	17-Aug-10	100	0.438	750	1,500	750	1,500	20.8	1,492	1,971	842	3,654	287	38
6	12878	20-Aug-10	100	0.433	750	1,500	750	1,500	25.2	1,187	1,840	818	3,476	204	41
7	12904	08-Sep-10	95	0.492	750	1,500	750	1,500	14.6	1,124	1,738	794	3,327	149	42
8	12963	05-Oct-10	100	0.663	750	1,500	750	1,500	28.7	977	1,643	783	3,209	77	45
9	13035	12-Nov-10	97.5	0.364	750	1,500	750	1,500	22.3	1,382	1,614	738	3,089	138	43
10	13067	07-Dec-10	95	0.445	750	1,500	750	1,500	38.7	1,086	1,561	715	2,991	131	43
11	13099	05-Jan-11	100	0.511	750	1,500	750	1,500	19.7	1,286	1,536	684	2,903	169	42
12	13147	01-Feb-11	100	0.547	1,500	3,000	1,500	3,000	31.2	1,737	1,553	654	2,861	244	40
13	13214	01-Mar-11	95	0.583	6,000	>6,000	750	1,500	25.7	1,203	1,526	634	2,794	258	40
14	13572	05-Apr-11	100	0.530	750	1,500	750	1,500	24.2	1,106	1,496	619	2,734	257	40
15	13648	17-May-11	95	0.586	750	1,500	750	1,500	17.7	1,140	1,472	604	2,680	265	40
16	13666	01-Jun-11	97.5	0.680	1,500	3,000	750	1,500	24.5	1,246	1,458	586	2,630	286	39
17	13725	06-Jul-11	100	0.565	750	1,500	750	1,500	26.5	1,069	1,435	575	2,586	285	39
18	13775	02-Aug-11	96	0.534	1,500	3,000	1,500	3,000	10.5	2,243	1,480	590	2,659	301	39
19	13828	07-Sep-11	97.5	0.571	3,000	6,000	750	1,500	17.4	1,306	1,471	574	2,620	322	38
20	13877	04-Oct-11	100	0.579	1,500	3,000	750	1,500	20.4	1,385	1,467	559	2,585	348	37
Avg			98	0.513	1875	1950	881	1763		1467	1718	666	3015	351	

Notes:
Dilution series - 0.375 g/L - 6.0 g/L
NOEC - No Observable Effect Concentration (survival or growth)
LOEC - Lowest Observable Effect Concentration (survival or growth)
ACCEPTABLE TEST RESULTS - A growth NOEC ranging from 750 mg/L to 3,000 mg/L.
(*) Minimum USEPA CONTROL CRITERIA - 80 percent survival and average dry weight of 0.25 mg (weight based on surviving number of fish).

CHRONIC REFERENCE TOXICANT TEST (NaCl) 2010 - 2011
FATHEAD MINNOWS